WHAT IS CLAIMED IS:

1   1.   A method for preparing a library of compounds, comprising:

2   a) providing a plurality of individual synthesis templates each comprising a solid

3   support, wherein said solid support has an interior portion and an exterior

4   portion each with a plurality of reactive functional groups, wherein said solid

5   support is linked to a scaffold via a scaffold linker, wherein said scaffold has

6   at least two scaffold functional groups, and wherein at least two coding tag

7   precursors, each comprising a coding functional group and a coding linker, are

8   attached to said solid support;

9   b) contacting a first synthesis template with a first reactive component such that a

10   first scaffold functional group reacts with said first reactive component to

11   afford a first scaffold building block, and a first coding functional group reacts

12   with said first reactive component to afford a first coding building block;

13   c) contacting said first synthesis template with a successive reactive component such

14   that a subsequent scaffold functional group reacts with said successive reactive

15   component to afford a subsequent scaffold building block, and a subsequent

16   coding functional group reacts with said successive reactive component to

17   afford a subsequent coding building block;

18   d) repeating step c) until said first compound has been prepared; and

19   e) subjecting additional synthesis templates to steps b) - d) with additional reactive

20   components to prepare said library of compounds.

1   2.   The method of claim 1, further comprising the following step:

2   f) cleaving each of said compounds from each of said synthesis templates.

1   3.   The method of claim 1, wherein the number of said scaffold functional

2 groups equals the number of said coding functional groups.

1   4.   The method of claim 1, wherein said reactive component reacts with

2 said scaffold functional group and said coding functional group via a reaction selected from

3 the group consisting of amine acylation, reductive alkylation, aromatic reduction, aromatic

4 acylation, aromatic cyclization, aryl-aryl coupling, [3+2] cycloaddition, Mitsunobu reaction,

5 nucleophilic aromatic substitution, sulfonylation, aromatic halide displacement, Michael

6 addition, Wittig reaction, Knoevenagel condensation, reductive amination, Heck reaction,

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7   Stille reaction, Suzuki reaction, Aldol condensation, Claisen condensation, amino acid

8   coupling, amide bond formation, acetal formation, Diels-Alder reaction, [2+2] cycloaddition,

9   enamine formation, esterification, Friedel Crafts reaction, glycosylation, Grignard reaction,

10   Horner-Emmons reaction, hydrolysis, imine formation, metathesis reaction, nucleophilic

11   substitution, oxidation, Pictet-Spengler reaction, Sonogashira reaction, thiazolidine

12   formation, thiourea formation and urea formation.

1   5.   The method of claim 1, wherein said compounds of said library are

2   prepared in parallel.

1   6.   The method of claim 1, wherein at least one of said synthesis templates

2   has a structure of formula I:

3                     $(G^i)_n - (S) - L - (\bullet) - (L' - (G')^i)_n$ **(I)**
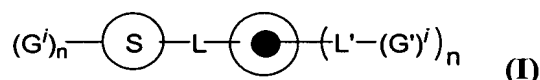
4   wherein

5       $(G^i)_n$ represents n independent scaffold functional groups, G^1 to G^n, wherein each G^i is

6   one of said scaffold functional groups;

7   (S) is said scaffold;

8   L is said scaffold linker;

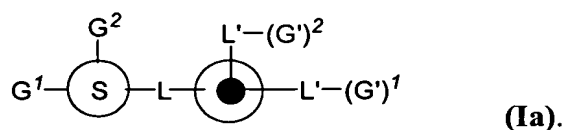9 $(\bullet)$ is said solid support, wherein the darkened portion represents said interior

10   portion of said solid support, and the lightened portion represents said exterior

11   portion of said solid support;

12       $(-L'-(G')^i)_n$ represents n independent coding tag precursors, wherein each of said

13   coding tag precursors comprises one of n independent coding functional

14   groups, $(G')^1$ to $(G')^n$, each linked to said solid support via one of n coding

15   linkers, wherein each $(G')^i$ is one of said coding functional groups, and L' is
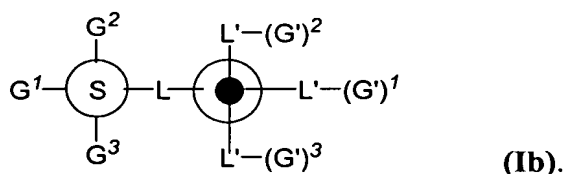
16   said coding linker;

17   subscript n is an integer from 2 to 10; and
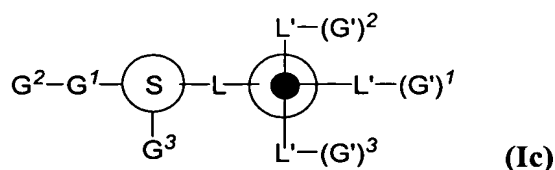
18   superscript i is an integer from 1 to n.

1   7.   The method of claim 6, wherein said synthesis template has a structure

2 of formula Ia:

$$G^1-\underset{}{\boxed{S}}-L-\overset{L'-(G')^2}{\underset{}{\boxed{\bullet}}}-L'-(G')^1 \qquad \textbf{(Ia)}.$$

with G^2 above the S scaffold.

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1   8.   The method of claim 6, wherein said synthesis template has a structure

2 of formula Ib:

$$G^1-\underset{G^3}{\overset{G^2}{\boxed{S}}}-L-\underset{L'-(G')^3}{\overset{L'-(G')^2}{\boxed{\bullet}}}-L'-(G')^1 \qquad \textbf{(Ib)}.$$

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1   9.   The method of claim 1, wherein said synthesis template has a structure

2 of formula Ic:

$$G^2-G^1-\underset{G^3}{\boxed{S}}-L-\underset{L'-(G')^3}{\overset{L'-(G')^2}{\boxed{\bullet}}}-L'-(G')^1 \qquad \textbf{(Ic)}$$

3

4 wherein

5   each of G^1, G^2 and G^3 is one of said scaffold functional groups;

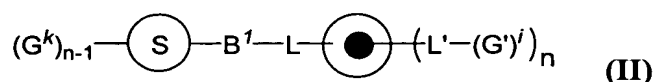6 $\boxed{S}$ is said scaffold;

7   L is said scaffold linker;

8       $\boxed{\bullet}$ is said solid support, wherein the darkened portion represents said interior

9   portion of said solid support, and the lightened portion represents said exterior

10   portion of said solid support; and

11   each of -L'-(G')^1, -L'-(G')^2 and -L'-(G')^3 is one of said coding tag precursors, each

12   comprising said coding functional group linked to said solid support via said

13   coding linker.

1   10.   The method of claim 1, wherein at least one of said synthesis templates

2   has a structure of formula II:

3                 $(G^k)_{n-1}$—(S)—B^1—L—(⬤)—$(L'-(G')^i)_n$ **(II)**

4   wherein

5   B^1 represents a first scaffold building block;

6          $(G^k)_{n-1}$ represents n-1 independent scaffold functional groups, G^2 to G^n, wherein each

7   G^k is one of said scaffold functional groups;

8   (S) is said scaffold;

9   L is said scaffold linker;

10   (⬤) is said solid support, wherein the darkened portion represents said interior

11   portion of said solid support, and the lightened portion represents said exterior

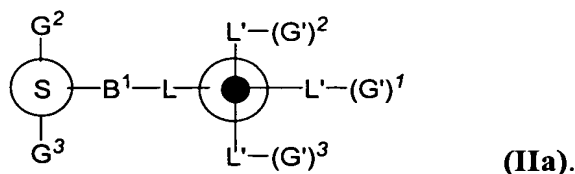12   portion of said solid support;

13         $(-L'-(G')^i)_n$ represents n independent coding tag precursors, wherein each of said

14   coding tag precursors comprises one of n independent coding functional

15   groups, $(G')^1$ to $(G')^n$, each linked to said solid support via one of n coding

16   linkers, wherein each $(G')^i$ is one of said coding functional groups, and L' is

17   said coding linker;

18   subscript n is an integer from 2 to 10;
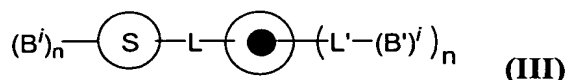
19   superscript i is an integer from 1 to n; and

20   superscript k is an integer from 2 to n.

1   11.   The method of claim 10, wherein said synthesis template has a

2   structure of formula IIa:

$$\begin{array}{c} G^2 \\ | \\ (S)-B^1-L-(⬤) \\ | \\ G^3 \end{array} \quad \begin{array}{c} L'-(G')^2 \\ | \\ -L'-(G')^1 \\ | \\ L'-(G')^3 \end{array}$$

3   **(IIa)**.

1   12.   The method of claim 1, wherein said steps a) - d) afford a compound

2   template of formula III:

3                 $(B^i)_n$—(S)—L—(⬤)—$(L'-(B')^i)_n$ **(III)**

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4   wherein

5     $(B^i)_n$ represents n independent scaffold building blocks, B^I to B^n, wherein each B^i is

6   one of said scaffold building blocks;

7   (S) is said scaffold;

8   L is said scaffold linker;

9   (●) is said solid support, wherein the darkened portion represents said interior

10   portion of said solid support, and the lightened portion represents said exterior
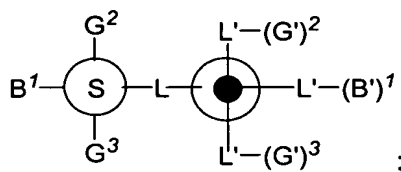
11   portion of said solid support;

12     $(-L'-(B')^i)_n$ represents n independent coding tags, wherein each of said coding tags

13   comprises one of n independent coding building blocks, $(B')^I$ to $(B')^n$, each

14   linked to said solid support via one of n coding linkers, wherein each $(B')^i$ is

15   one of said coding building blocks, and L' is said coding linker;

16   subscript n is an integer from 2 to 10; and

17   superscript i is an integer from 1 to n.

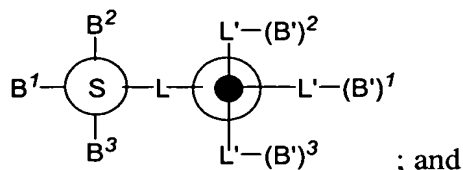1   13.   The method of claim 1, comprising:

2   a) providing a plurality of individual synthesis templates according to formula Ib;

3   b) contacting a first synthesis template with a first reactive component to afford the

4   following structure:

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6   c) contacting said first synthesis template with a successive reactive component to

7   afford the following structure:

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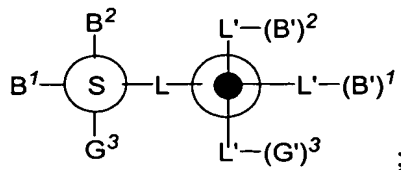
9   d)   repeating step c) to prepare said compound attached to the following compound

10   template according to claim 12:

$$B^1-\!\!\left(\,S\,\right)\!-L-\!\!\left(\bullet\right)\!-L'-(B')^1$$

with B^2 and B^3 attached to S, and $L'-(B')^2$ and $L'-(B')^3$ attached to the filled circle ; and

12   e)   subjecting additional of said synthesis templates to steps b) - d) with additional of

13   said reactive components in order to prepare said library of compounds.

1   14.   The method of claim 13, further comprising the following step:

2   f)   cleaving each of said compounds from each of said compound templates.

1   15.   The method of claim 1, wherein, on each of said synthesis templates,

2 each of said scaffold building blocks is encoded by a single coding building block.

1   16.   The method of claim 1, further comprising the following step:

2   f)   decoding each of said compounds by cleaving each of said coding tags from said

3   synthesis template and analyzing said coding tags to determine the identity of

4   said corresponding scaffold building blocks.

1   17.   The method of claim 17, wherein said analyzing is carried out via mass

2 spectrometry.

1   18.   The method of claim 1, wherein said scaffold is the same on each of

2 said synthesis templates.

1   19.   The method of claim 1, wherein at least two different scaffolds are

2 used.

1   20.   The method of claim 1, wherein said scaffold is a member selected

2 from the group consisting of quinazoline, tricyclic quinazoline, purine, pyrimidine,

3 phenylamine-pyrimidine, phthalazine, benzylidene malononitrile, amino acid, tertiary amine,

4 peptide, lactam, sultam, lactone, pyrrole, pyrrolidine, pyrrolinone, oxazole, isoxazole,

5 oxazoline, isoxazoline, oxazolinone, isoxazolinone, thiazole, thiozolidinone, hydantoin,

6 pyrazole, pyrazoline, pyrazolone, imidazole, imidazolidine, imidazolone, triazole,

7 thiadiazole, oxadiazole, benzofuran, isobenzofuran, dihydrobenzofuran,

8 dihydroisobenzofuran, indole, indoline, benzoxazole, oxindole, indolizine, benzimidazole,

9   benzimidazolone, pyridine, piperidine, piperidinone, pyrimidinone, piperazine, piperazinone,

10   diketopiperazine, metathiazanone, morpholine, thiomorpholine, phenol, dihydropyran,

11   quinoline, isoquinoline, quinolinone, isoquinolinone, quinolone, quinazolinone,

12   quinoxalinone, benzopiperazinone, quinazolinedione, benzazepine and azepine.

1   21.   The method of claim 1, wherein said library of compounds is prepared

2   via a split-mix methodology.

1   22.   A library of compounds prepared by the method of claim 1.

1   23.   A library of compounds prepared by the method of claim 2.

1   24.   A method for identifying a compound of claim 1 that binds to a target,

2   said method comprising:

3   a)   contacting said compound of claim 1 with said target; and

4   b)   determining the functional effect of said compound upon said target.

1   25.   The method of claim 24, wherein said biological target is a protein

2   kinase.

1   26.   A method for identifying a compound of claim 2 that binds to a target,

2   said method comprising:

3   a)   contacting said compound of claim 2 with said target; and

4   b)   determining the functional effect of said compound upon said target.

1   27.   The method of claim 26, wherein said target is a protein kinase.

1   28.   A method for preparing a library of compounds, comprising:

2   a)   providing a population of individual synthesis templates each comprising a solid

3   support, wherein said solid support has an interior portion and an exterior

4   portion each with a plurality of reactive functional groups, wherein said solid

5   support is linked to a scaffold via a scaffold linker, wherein said scaffold has

6   at least two scaffold functional groups, and wherein at least two coding tag

7   precursors, each comprising a coding functional group and a coding linker, are

8   attached to said solid support;

9   b)   splitting said population of synthesis templates into two or more separate pools;

10   c)   contacting said population of synthesis templates with one or more first reactive

11   components in said two or more separate pools such that a first scaffold

12   functional group reacts with one of said first reactive components to afford a

13   first scaffold building block, and a first coding functional group reacts with

14   one of said first reactive components to afford a first coding building block,

15   wherein said contacting step yields subsequent synthesis templates;

16   d)   mixing said subsequent synthesis templates from said two or more separate pools

17   into a single pool;

18   e)   splitting said subsequent synthesis templates into two or more separate pools;

19   f)   contacting said subsequent synthesis templates in said two or more separate pools

20   with a successive reactive component such that a subsequent scaffold

21   functional group reacts with said successive reactive component to afford a

22   subsequent scaffold building block, and a subsequent coding functional group

23   reacts with said successive reactive component to afford a subsequent coding

24   building block, wherein said contacting step yields further synthesis templates;

25   g)   repeating steps d) - f), wherein said further synthesis templates of step f) become

26   said subsequent synthesis templates of step d), until said library of compounds

27   has been prepared.